

PATENT APPLICATION
Docket No. 11675.99.1



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE)

Philip J. Ireland et al.

09/300,363

April 26, 1999

CONTACT STRUCTURE

Matthew E. Warren

4379

DECLARATION UNDER 37 C.F.R. § 1.131

We, Philip J. Ireland and Howard E. Rhodes declare as follows:

1. We are the co-inventors of the invention claimed in the above-identified patent application Serial No. 09/300,363, which is a divisional of application Serial No. 09/146,742, filed on September 3, 1998, now Patent No. US 6,348,411 B1. We are employed by Micron Technology, Inc. in Boise Idaho.

2. During our employment at Micron Technology, Inc. and prior to June 8, 1998, we conceived the idea of a contact structure as presently claimed in the above identified patent application. For example, prior to June 8, 1998 we conceived the idea for an integrated circuit comprising: a lower bulk insulator layer situated above a semiconductor substrate, the lower bulk insulator having upper and lower surfaces; a conductor layer situated above the lower bulk insulator layer; a sleeve insulator layer in contact with the conductor layer, the sleeve insulator

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layer comprising a first terminus and a second terminus opposite the first terminus, the second terminus located between the upper and lower surfaces of the lower bulk insulator; and a conductive contact extending from and beyond the sleeve insulator layer to terminate at a contact on the semiconductor substrate, the conductive contact being electrically insulated from the conductor layer by the sleeve insulator layer, as described and claimed in the above-identified patent application Serial No. 09/300,363. Copies of invention disclosure documents describing and showing the inventive concepts of the presently claimed invention are attached hereto as Exhibits A and B.

3. The attached invention disclosure documents (Exhibits A and B) were submitted to the patent department of Micron Technology, Inc. on March 7, 1994 and December 28, 1995, respectively, to obtain approval for filing of a patent application on our invention.

4. Subsequent thereto, the invention disclosure documents were sent to our patent attorneys at Workman, Nydegger & Seeley in Salt Lake City, Utah to begin preparation of a patent application.

5. An initial draft of the patent application was sent to us by our patent attorneys at Workman, Nydegger & Seeley with their letter dated June 27, 1996, attached hereto as Exhibit C.

6. A revised draft of the application was communicated to our patent attorneys at Workman, Nydegger & Seeley with a letter dated January 6, 1997, attached hereto as Exhibit D.

7. Another revised draft of the application was communicated to our patent attorneys at Workman, Nydegger & Seeley with a letter dated August 14, 1997, attached hereto as Exhibit E.

8. Yet another revised draft of the application was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated August 27, 1997, attached hereto as Exhibit F.

9. Another revised draft of the application was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated October 14, 1997, attached hereto as Exhibit G.

10. Another revised draft of the application was communicated to our patent attorneys at Workman, Nydegger & Seeley with a letter dated October 30, 1997, attached hereto as Exhibit H.

11. Yet another revised draft of the application was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated February 2, 1998, attached hereto as Exhibit I.

12. Another revised draft of the application was communicated to our patent attorneys at Workman, Nydegger & Seeley with a letter dated February 10, 1998, attached hereto as Exhibit J.

13. Yet another revised draft of the application was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated March 30, 1998, attached hereto as Exhibit K.

14. Yet another revised draft of the application was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated April 8, 1998, attached hereto as Exhibit L.

15. Another revised draft of the application was communicated to our patent attorneys at Workman, Nydegger & Seeley with a letter dated April 21, 1998, attached hereto as Exhibit M.

16. Yet another revised draft of the application was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated June 18, 1998, attached hereto as Exhibit N.

17. Another revised draft of the application was communicated to our patent attorneys at Workman, Nydegger & Seeley with a letter dated August 27, 1998, attached hereto as Exhibit O.

18. The final draft of the application, which was subsequently filed as the parent to the above-identified application, was received from our patent attorneys at Workman, Nydegger & Seeley with a letter dated August 31, 1998, attached hereto as Exhibit P.

19. We declare further that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful, false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated this 10 day of May 2003.

Inventor: Philip J. Ireland
Philip J. Ireland Philip
6722 E. Locust Lane
Nampa, ID 83686

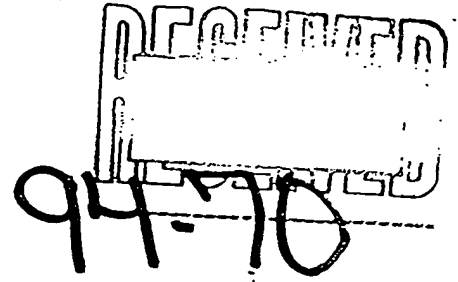
Dated this 11th day of April 2003.

Inventor: Howard E. Rhodes
Howard E. Rhodes
631 E. Ridgefield Drive
Boise, ID 83706

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MICRON TECHNOLOGY, INC.
INVENTION DISCLOSURE

micron Proprietary



INVENTOR(S): THOMAS FIGURA
KIRK PRALL

1. DESCRIPTION

DARPA or Gvt. project? ☐ NO

2.1 Title of invention: SIDE WALL ETCH FOR SELF ALIGNMENT (SWEFSA..?)

2.2 General description of the invention: A METHOD FOR FORMING AN AREA
CLEARED OF CELL POLY FOR SELF ALIGNMENT OF THE BIT CONTACT.

2.2(a) Describe what problem the invention is trying to solve:

THE INVENTION IS TRYING TO SOLVE THE PROBLEM OF BIT CONTACT TO CELL POLY
SHORTS. ALSO, THE METHOD DESCRIBED WITHIN THIS DISCLOSURE IS ALSO EASIER TO
IMPLEMENT THEN [REDACTED] OTHER METHODS BY ALLOWING THE CONTACT TO REMAIN LARGER
AND NOT HAVING TO DO A SPACER ETCH IN A DEEP CONTACT.

2.2(b) Describe what prior solutions have been used to solve this
problem: LEAVE ROOM FOR MISALIGNMENT, [REDACTED]

SEE ATTACHED REFERNECES

2.2(c) Describe the advantages of this invention over these
prior solutions:

THE METHOD DESCRIBED WITHIN THIS DISCLOSURE IS ALSO EASIER TO
IMPLEMENT THEN [REDACTED] OTHER METHODS BY ALLOWING THE CONTACT TO REMAIN LARGER
AND NOT HAVING TO DO A SPACER ETCH IN A DEEP CONTACT. IT ALSO GIVED MUCH
GREATER TOLERANCE BY SELF ALIGNING BETWEEN THE STORAGE NODES.

2.2(d) Describe how the invention works: AFTER THE FORMATION OF THE

STORAGE NODE PORTION OF THE CAPACITOR AND THE DEPOSITION OF THE DIELECTRIC, THE
CELL POLY IS DEPOSITED IN SUCH A THICKNESS TO BRIDGE BETWEEN AJOINING STORAGE
NODES. AFTER, A LAYER OF OXIDE OR NITRIDE IS DEPOSITED OVER THE CELL POLY. A
PHOTOMASK IS THEN PATTERNED TO UNCOVER AREAS WHERE THE BIT CONTACT WILL BE
FORMED AT LATER STEPS. ONCE THE PHOTOMASK IS DEFINED, A WET OR DRY ETCH WILL BE
USED TO ISOTROPICALLY ETCH THE OXIDE OR NITRIDE BACK TO AND POSSIBLY SOMEWHAT
UP THE SIDES OF THE STORAGE NODES, CREATING A HARDMASK ALONG THE TOPS AND SIDES
OF THE STORAGE NODES. WHEN THIS IS COMPLETE, THE PHOTORESIST IS REMOVED AND AN
ANISOTROPIC (OR ISOTROPIC) ETCH IS USED THE CLEAR THE CELL POLY, LEAVING AN
AREA CLEAR OF POLY EXACTLY UP THE THE EDGE OF THE STORAGE NODES, BUT WITHOUT
UNCOVERING THE CELL DIELECTRIC, POSSIBLY ELIMINATING THE NEED FOR ANY
RE-OXIDATIONS.

2.3 Please attach documentation: ie.- drawings, sketches and/or a process flow diagram.

SEE ATTACHED DIAGRAMS

2.4 Please identify similar/related ideas or disclosures and other companies working in the same field. Attach copies, if available.

SEE ATTACHED REFERENCES

3. INFORMATION CONCERNING CONCEPTION OF INVENTION

3.1 IMPORTANT DATES AND ACTIVITIES

a. Identify the date you first thought of the invention. (If not sure, give the earliest date of which you are sure.)

b. Identify to whom the idea first described and the date? (Other than a co-inventor.)

KPRALL AND PFAZAN AFTAB AHMAD AND CHUCK DENNISON

c. Identify the first date when the invention was reduced to a drawing, written description, computer simulation, etc. Please specify type and location.

FEBRUARY 4, 1994

d. Has the invention been disclosed outside the company? If yes, to whom, when, and in what form?

NO

e. Have any articles describing your invention been published? If yes, list author(s), title of article, publication and date.

NO

f. Have any engineering samples been given out? If yes, to whom and on what date?

NO

g. Has any product using the invention been sold or offered for sale? If yes, to whom and on what date?

NO

h. When will (or did) Micron begin use of the invention experimentally?

N/A

i. When will (or did) Micron begin production of this invention?

N/A

3.2 MISCELLANEOUS INFORMATION

- a. Was the invention developed during a joint development agreement or other contract with an outside company?
- b. Please list developmental work outside of the company:
- c. Was this invention conceived or first reduced to practice in the performance of work under a Government funded project (including DARPA-funded projects)? IF YES, check "DARPA project" on the front page.

4. CONTRIBUTIONS

4.1 List on this separate page the technical contributions of each named inventor:

IDEA FOR THICK CELL POLY TO BRIDGE BETWEEN STORAGE NODES CREATING A "WELL" WHERE THE BIT CONTACT WILL BE, ALLOWING FOR THE SIDEWALL SPACER...KIRK PRALL

IDEA FOR THE RECESSED SELF ALIGNED SIDEWALL SPACER....TOM FIGURA

5. INVENTORS:

Name: KIRK PRALL

Micron Phone: 3048

Company Name: MSI
(Subsidiary)

Dept. Name: R&D

Dept. #: 855

Street Address: 2548 S. HARMONY
(Street)

BOISE
(City)

ID
(State)

83706
(Zip)

Citizenship: U.S.A. !!!

Supervisor: TYLER LOWREY

Signature: *Kirk Prall*

Date:

Name: TOM FIGURA

Micron Phone: 3779

Company Name:
(Subsidiary)

M.S.I.

Dept. Name: R&D

Dept. #: 855

Street Address: 4313 DOUGLAS STREET
(Street)

BOISE
(City)

ID
(State)

83706
(Zip)

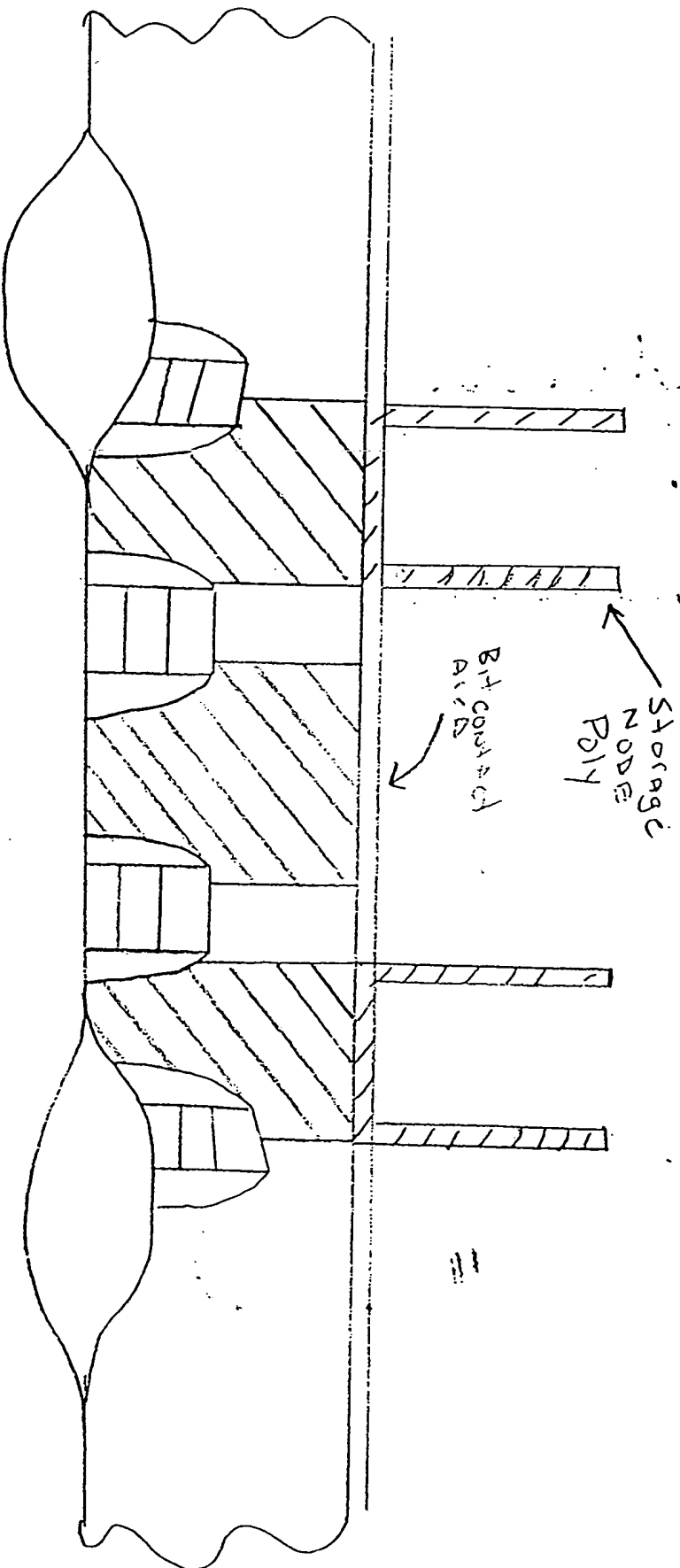
Citizenship: U.S.A.!!!!#1

Supervisor: PIERRE FAZAN

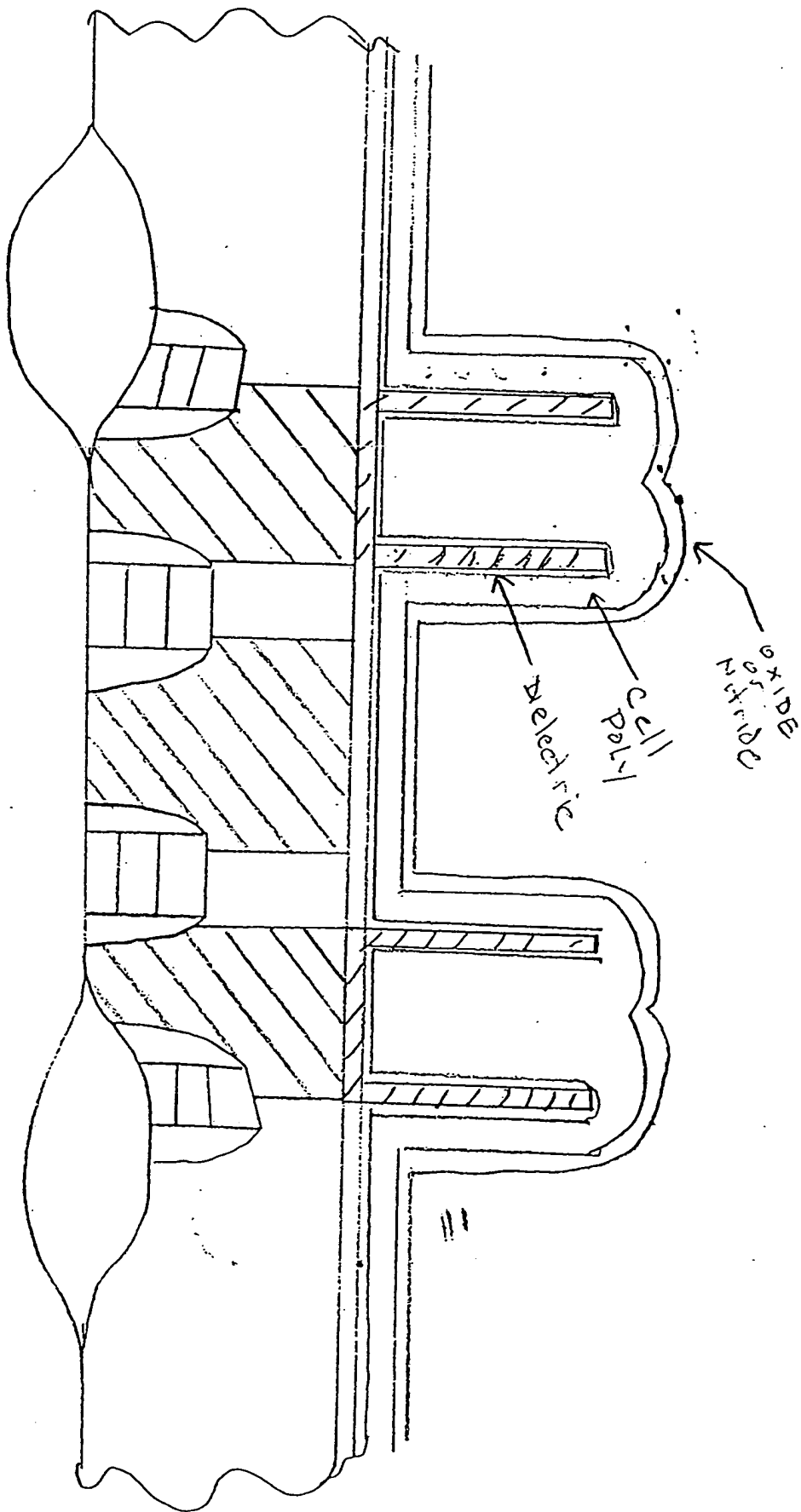
Signature: *Thomas Figura*

Date:

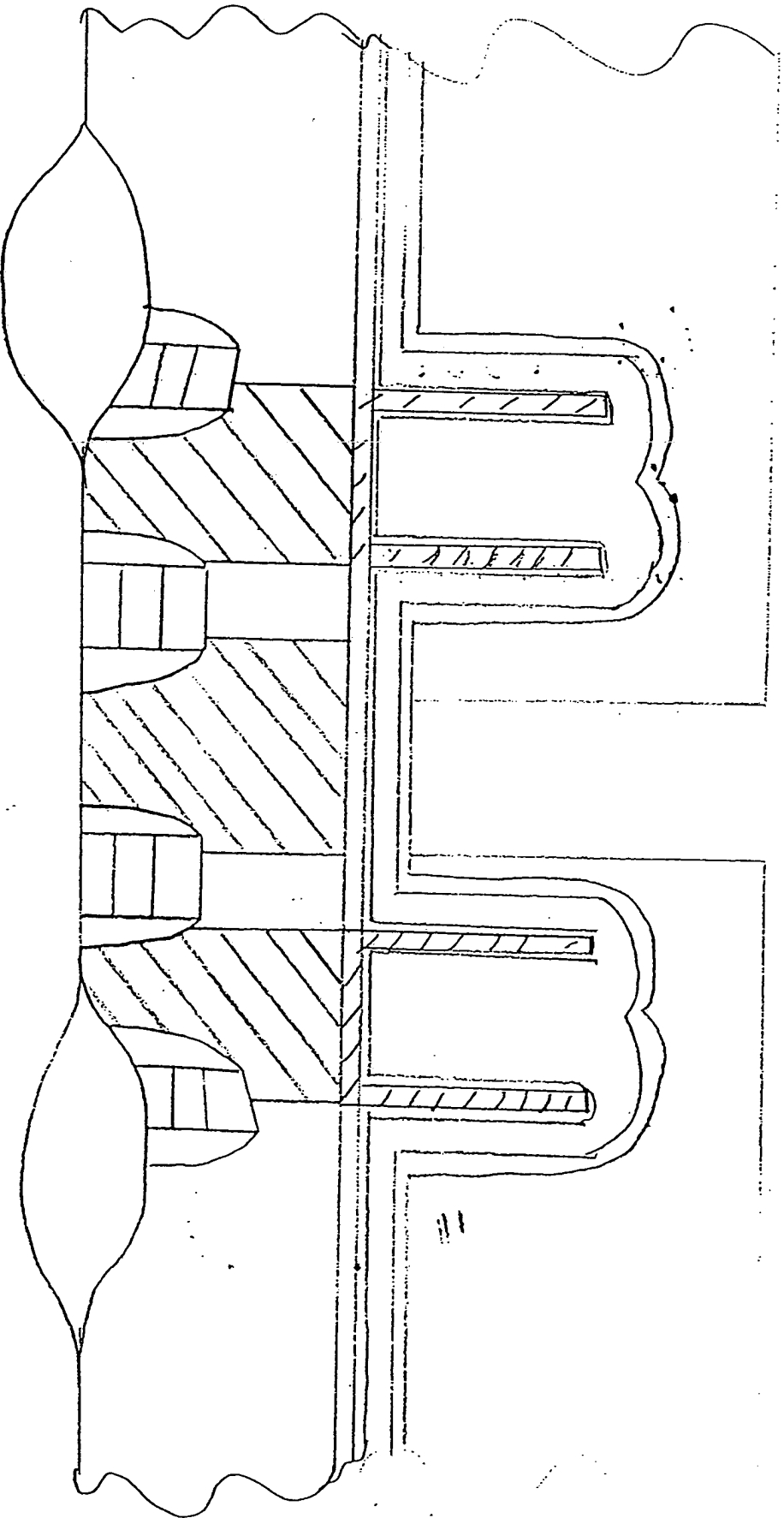
After Formation of the Storage Nodes



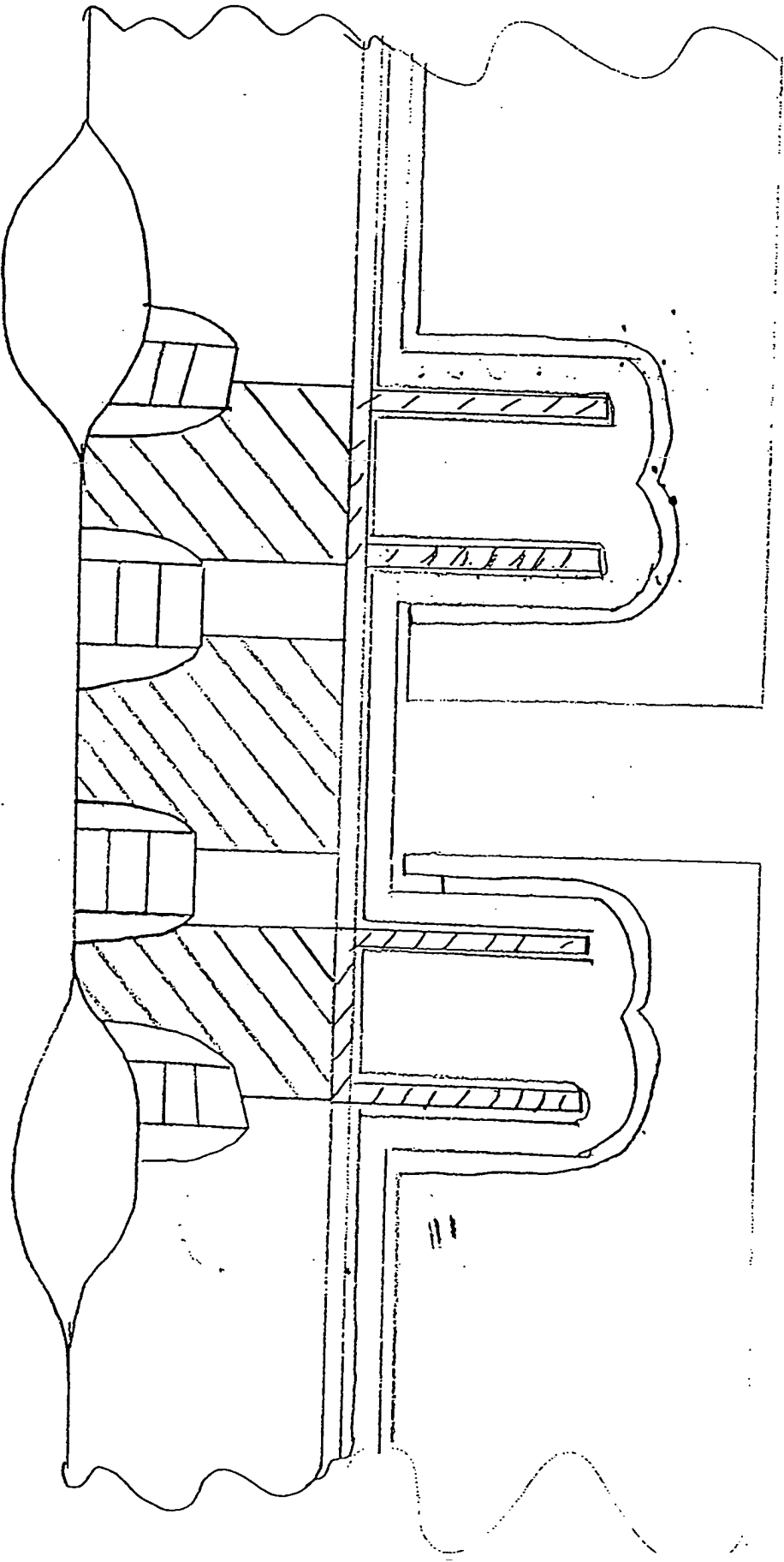
After cell Dielectric, cell poly and nitride/or oxide layer
Deposition.



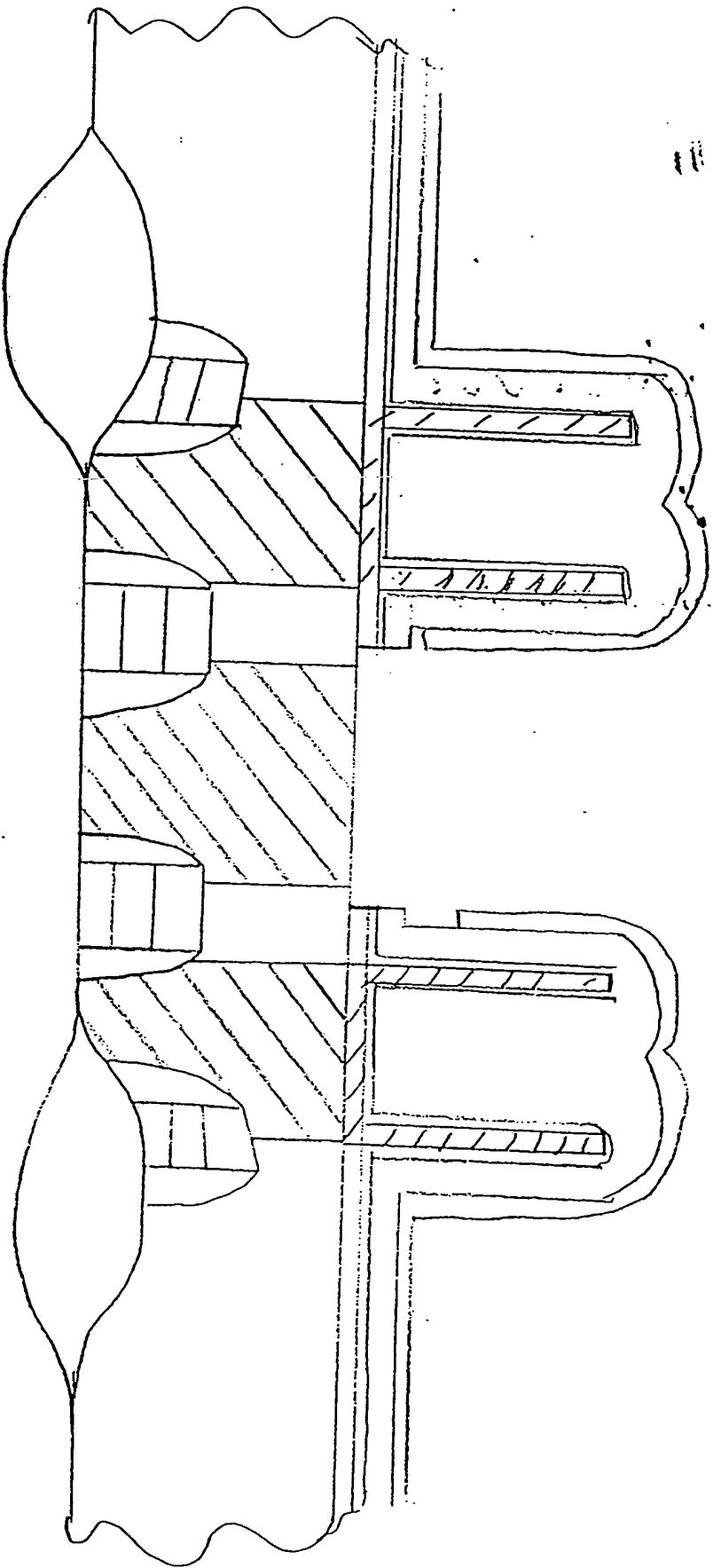
After pre-contact photomask. (worst case alignment is shown)



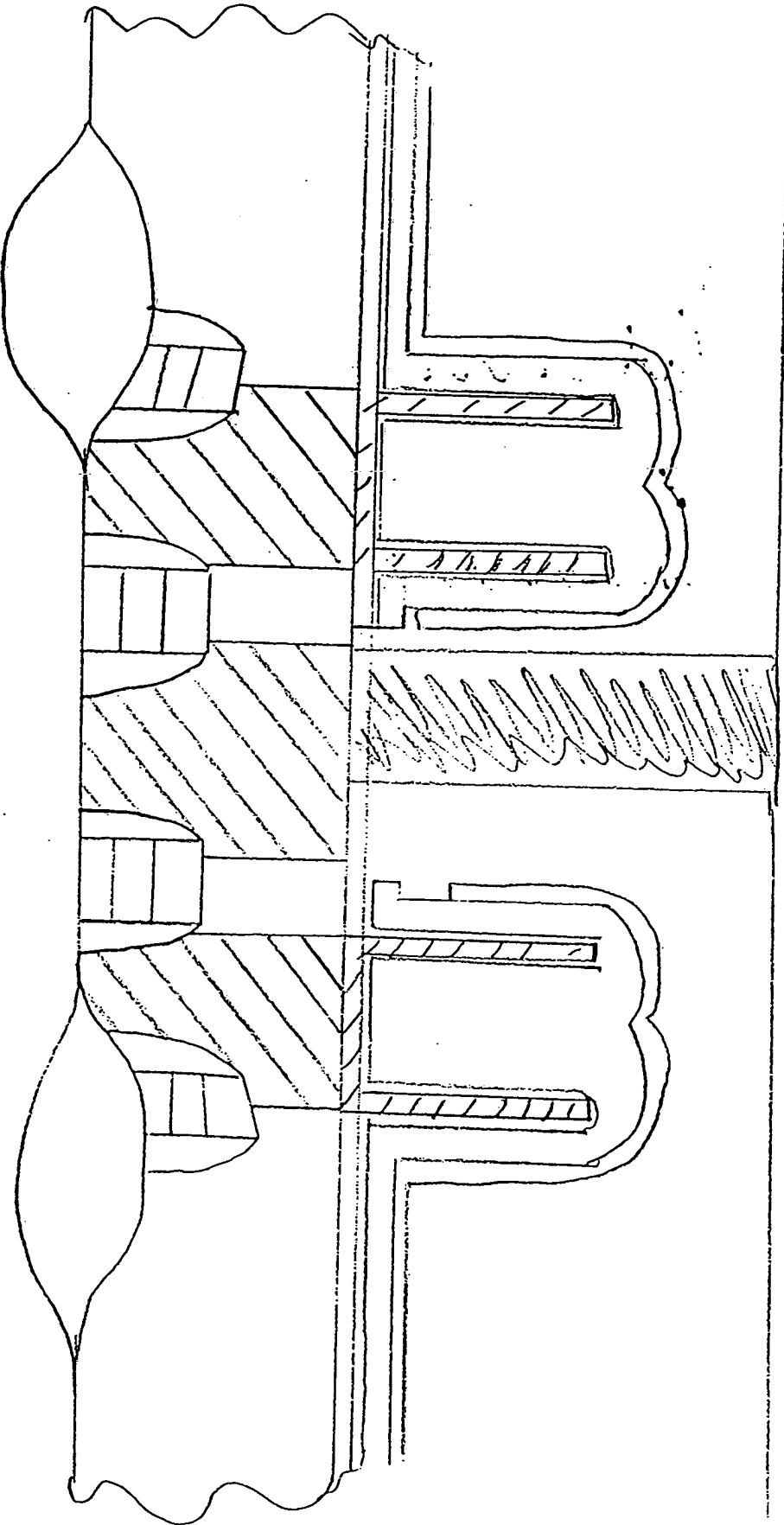
After wet or dry isotropic oxide or nitride etch.



After resist strip AND anisotropic poly etch.



After formation of Bit Contact.



TOP DOWN VIEW AFTER CELL POLY DEP.

Bridged
Cell Poly

Storage
NODE
Fig 1

Fig 1

Bit
Contact
Area

Fig 1

Fig 1

Fig 1

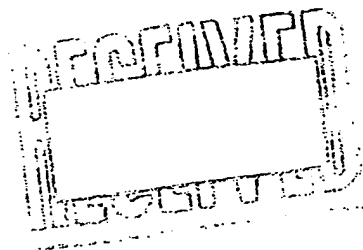
Fig 1

If ARPA project,
please check below:

INVENTION DISCLOSURE

___ Advanced SRAM
___ BST
___ FED
___ FE RAM
___ NCAICM

95-1141



1. INVENTOR(S): Philip J. Ireland

Howard E. Rhodes

2. DESCRIPTION

2.1 Title of invention:

Self Aligning Contacts Through Cell Plate

2.2 Brief description:

In the world of DRAMs, there are a sizeable number of layers with rapidly shrinking dimensions. With dimensions reducing to quarter micron scales, it has become more and more difficult to have sufficient process margin. In particular, photo and etch are areas with very tight constraints. One specific area of trouble is the aligning of one layer to the next.

Here we describe a process which provides more overall photo/etch margin in the alignment of the digit line contacts to Silicon through the cell plate:

A storage node is inherent in standard DRAM processes. Typically this node is created with a bottom layer of poly which makes contact to the Si, a subsequent dielectric and then a top poly layer. This top poly layer, referred to as the Cell plate, covers the entire array and has holes everywhere to allow the digit line contact to pass on through to the substrate. At the place where this contact passes through, there is always the potential of the contact itself shorting to the cell plate, depending upon alignment tolerances that are available. On a good process, there is plenty of space within the hole so that if misaligned some, there is plenty of room for the digit line contact to pass through without shorting to this cell plate. With the dimensions shrinking, there is less and less room for this digit line contact to pass through.

This patent utilizes a process wherein a material is deposited over the cell plate (possibly Si₃N₄, silicon nitride). Subsequent to this, the standard contact opening would be created, but now it would also pass through this additional layer, through the poly and then slightly into the BPSG (poly overetch margin). After this etch has been done and resist stripped, another layer of CVD Si₃N₄ would cover the entire wafer, plus down into this contact opening and into the slightly recessed BPSG hole created during the cell plate contact opening etch. The material used in this process should have the properties of being electrically insulating, have a high degree of selectivity with regards to the main dielectric glass (BPSG, PSG, etc) and yet is quite etchable on the open flat areas. An example of such would be Si₃N₄, wherein, one could deposit the Si₃N₄ over the top of the cell plate and into the hole created in the cell plate, follow this up

with an anisotropic etch. In doing this, one is not with a vertical material covering the cell plate edges. Subsequent process steps would be an additional BPSG layer, it's reflow/densification anneals, contact photo/align and etch. In performing the actual contact etch (different than the contact opening etch), if an etch is used that has some selectivity to the Si_3N_4 , then when the contact etch reaches this level, it will steer its way into the contact opening hole in the poly. That is if the alignment of the contact photo process is not perfectly centered with the contact opening process, then the self aligning spacer will provide some margin at the contact etch such that direct contact of the contact to the cell plate is avoided.

- 2.3 Also attach a complete description, including drawings or sketches and articles relevant to the invention. Legible photocopies of laboratory notebooks are acceptable.

3. INFORMATION CONCERNING CONCEPTION OF INVENTION

3.1 CONCEPTION AND DOCUMENTATION OF THE INVENTION

- a. Identify the date when you first conceived the invention. (If not sure, give the earliest date of which you are sure.)
- b. To whom was the idea first described and on what date? (Other than a co-inventor.)

Kirk Prall
- c. Identify the date of the first tangible record such as computer simulation, tape out, drawing or written description. Please specify type and location.

3.2 CONCEPTION OF THE INVENTION

- a. Please identify related invention disclosures, patents or other publications describing similar ideas, and other companies working in the same field. Attach copies, if available.
- b. What is the closest technology, of which you are aware?
Spacers are used in other types of processes
- c. Identify the advantages of this invention over previous technology.
Current technology inherently has the potential for shorts.

3.3 IMPORTANT DATES

- a. Has the invention been disclosed outside the company? _____
If yes, to whom, when, and in what form?
No
- b. Have any articles describing your invention been published?
_____ If yes, list author(s), title of article, publication and date.
None that I know of for this level.
- c. Have any engineering samples been given out? No If yes, to whom and on what date?
- d. Has any product using the invention been sold or offered for sale? No If yes, to whom and on what date?

3.4 DISPOSITION OF THE INVENTION

- a. When will (or did) Micron begin use of the invention experimentally?
Currently paper only
- b. When will (or did) Micron begin production of this invention?

3.5 MISCELLANEOUS INFORMATION

- a. Was the invention developed during a joint development agreement or other contract with an outside company? No

- b. Please list developmental work outside of the company (including Government proposal or contract). None

4.. INVENTORS:

Name: Philip J. Ireland

Micron Phone: 4709 Micron Mail Stop: 306

Company Name (VERY IMPORTANT): Dept. Name: Advanced DRAM/Process
Development

☒ Micron Semiconductor, Inc. Dept. #: 850G
☐ Micron Computer, Inc.
☐ Micron Custom Manufacturing Services, Inc.
☐ Micron Display Technology, Inc.
☐ Micron Communications, Inc.
☐ Other

Home Address: 5660 Tecoma
Boise, ID 83705

Citizenship: US

Supervisor: Howard Rhodes

Signature: Philip J. Ireland Date:

Name: Howard Rhodes

Micron Phone: 4759 Micron Mail Stop: 306

Company Name (VERY IMPORTANT): Dept. Name: Advanced DRAM/Process
Development

☒ Micron Semiconductor, Inc. Dept. #: 850G
☐ Micron Computer, Inc.
☐ Micron Custom Manufacturing Services, Inc.
☐ Micron Display Technology, Inc.
☐ Micron Communications, Inc.
☐ Other

Home Address: 631 E. Ridgfield Pl.
Boise, ID 83706

Citizenship: US

Supervisor: Tyler Lowrey

Signature: Howard E. Rhodes Date:

-- If more than three inventors use additional form(s) available in the Legal Department, 3rd floor, Administration building. --

5. WITNESS

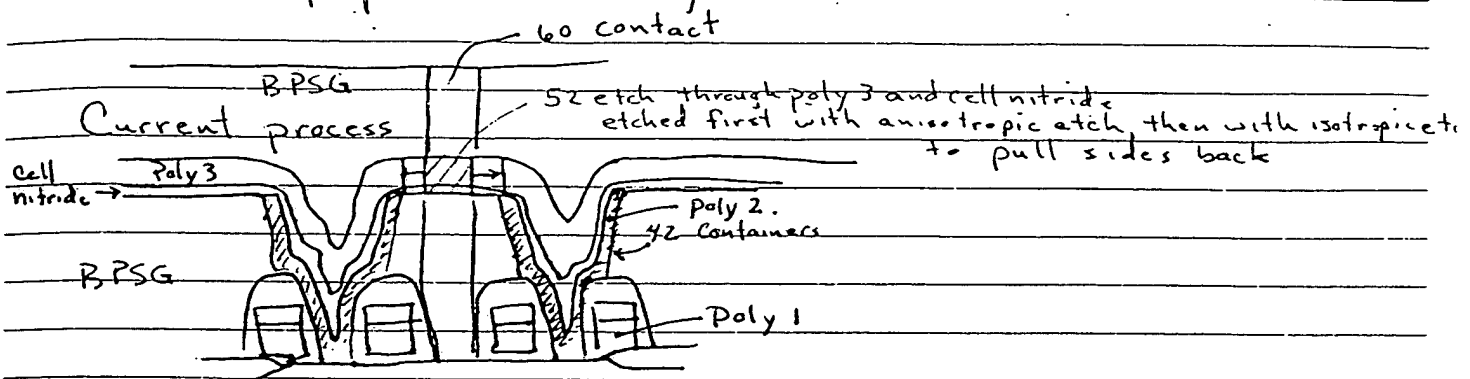
If there is only one inventor, a witness should sign and date this disclosure. A witness in this case is a non-inventor who understands the nature of the invention.

(Signature of Witness)

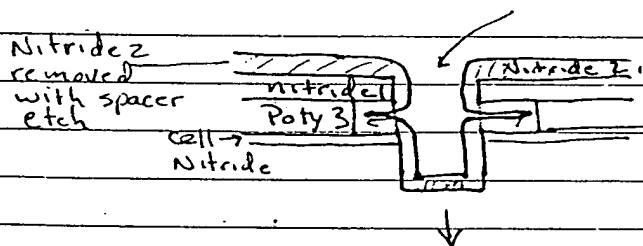
(Date)

Note: If you have any questions or wish assistance completing this form, please call the Legal/Patent Department, ext. 4527.

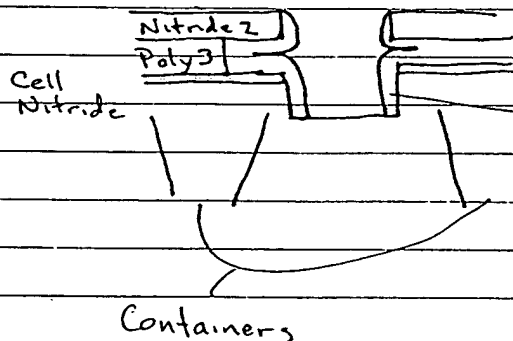
One problem that we are experiencing at 60 level is Photo/etch. In order to provide more margin, Howard Rhodes and myself would like to propose the following



What we are proposing is to add a nitride layer on top of poly 3, do the same 52 etch (through this nitride layer and poly) and then continue this etch a little ways into the oxide. This would be followed by another nitride layer and a spacer etch leaving the following structure



After 52 etch



This Nitride spacer will then act as a guiding sleeve for 60 etch which comes right through the middle of this hole to give us more photo/etch margin at 60 etch between the 60 contact and poly 3 as well as between 60 and 42 containers. In addition to this, it will improve how the 60 etch lines up with the spacers by poly 1

P. J. Delaney

[Signature]

WORKMAN NYDEGGER & SEELEY

ATTORNEYS AT LAW

A PROFESSIONAL CORPORATION

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SALT LAKE CITY, UTAH 84111

TELEPHONE (801) 533-9800

FACSIMILE (801) 328-1707

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KENT S. BURNINGHAM
LARRY R. LAYCOCK
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DAVID R. WRIGHT
JOHN C. STRINGHAM
MICHAEL F. KRIEGER
BRADLEY K. DESANDRO
JOHN M. GUYNN
GREGORY M. TAYLOR
DANA L. TANGREN
ERIC L. MASCHOFF

KEVIN B. LAURENCE
BRIAN C. KUNZLER
SUSAN K. MORRIS
JEFFREY L. RANCK
CHARLES J. VEVERKA
JONATHAN D. WOOD[†]
ROBYN L. PHILLIPS[†]
DAVID B. DELLENBACH
TIMOTHY M. FARRELL
LENA I. VINITSKAYA*

[†] MEMBER ARKANSAS BAR ONLY

[†] MEMBER OREGON BAR ONLY

* REGISTERED PATENT AGENT

ALLEN R. JENSEN
OF COUNSEL

PATENT
TRADEMARK
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TRADE SECRETS
UNFAIR COMPETITION
LICENSING
COMPLEX LITIGATION

INTERNET

HOME PAGE: <http://www.wnspat.com>

GENERAL E-MAIL: info@wnspat.com

June 27, 1996

VIA HAND DELIVERY

Ms. Curi Walker
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

Re: New United States Patent Application for
Self Aligning Contact Structure and Method of Manufacture
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Curi:

Enclosed for your files are copies of the first draft of the above-entitled patent application and the drawings. Copies of the patent application and drawing are also enclosed for review by Mike Lynch.

By copy of this letter, I also enclose for review by the inventors Philip J. Ireland and Howard E. Rhoads copies of the first draft of the above-entitled patent application and the drawing, with the following instructions:

If a few corrections are required, please make those corrections directly on the face of the enclosed patent application and date and initial (in the margin) each correction. If extensive changes are necessary, please make those changes on the face of the application document, without initialing, and return it to us.

Ms. Curi Walker
June 27, 1996
Page 2

Once the patent application has been reviewed and finalized, we will forward the final draft, drawing, the Declaration, Power of Attorney, and Petition, and an Assignment for your signature before filing with the United States Patent and Trademark Office.

Best regards.

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:mkk

G:\DATA\WPDOCS2\MKK\MICRON\1167599.CUR

cc: Michael L. Lynch, Esq.
Philip J. Ireland
Howard E. Rhoads

Enclosures: Patent Application (4 copies)
Drawings (4 sets)

MICRON

TECHNOLOGY, INC.

January 6, 1997

Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111

Re: Micron Ref. No. 95-1141
Your Ref. No. 11675.99
SELF ALIGNING CONTACT STRUCTURE AND METHOD
OF MANUFACTURE

Dear Brad:

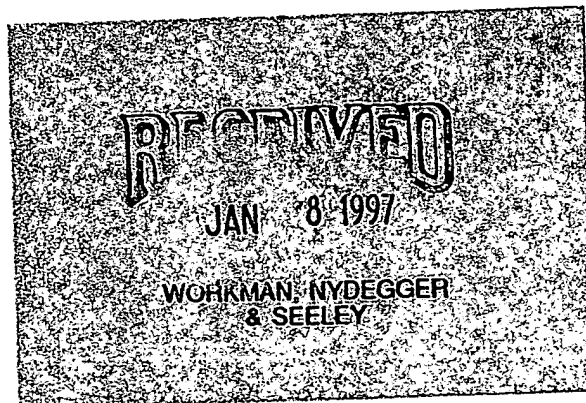
Enclosed please find a revised draft application, for the above case, I am forwarding to you on behalf of Mike Lynch. If you have any questions regarding these revisions, please feel free to contact Mr. Lynch directly (208) 368-3484.

Very truly yours,



Susan R. Jerome
Patent Assistant

phone: (208) 368-4508
fax: (208) 368-5606





August 14, 1997

*Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111*

*RE: Micron Docket No. 95-1141
Your Ref. No. 11675.99
SELF ALIGNING CONTACT STRUCTURE AND METHOD
OF MANUFACTURE*

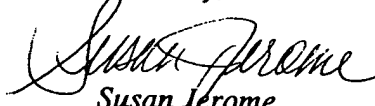
Dear Brad:

Enclosed please find a revised draft application, for the above case, I am forwarding to you on behalf of Sam Ireland.

An additional comment Mr. Ireland made to me regarding the claims was: "...the claims are too long and have gone overboard...". Mr. Ireland stated that he "got lost".

If you have any questions, please do not hesitate to call.

Sincerely,


Susan Jerome
Patent Assistant

*phone: (208) 368-4508
fax: (208) 368-5606*

WORKMAN NYDEGGER & SEELEY

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A PROFESSIONAL CORPORATION

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THOMAS R. VUKSINICK
LARRY R. LAYCOCK
JONATHAN W. RICHARDS
DAVID R. WRIGHT
JOHN C. STRINGHAM
MICHAEL F. KRIEGER
BRADLEY K. DESANDRO
JOHN M. GUYNN
GREGORY M. TAYLOR
DANA L. TANGREN
KEVIN B. LAURENCE
ERIC L. MASCHOFF

SUSAN K. MORRIS
JEFFREY L. RANCK
CHARLES J. VEVERKA
JONATHAN D. WOOD
ROBYN L. PHILLIPS
DAVID B. DELLENBACH
TIMOTHY M. FARRELL
JOHN N. GREAVES
VANESSA B. PIERCE
LENA I. VINITSKAYA
KEVIN K. JOHANSON

PATENT
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LICENSING
COMPLEX LITIGATION

INTERNET

HOME PAGE: <http://www.wnspat.com>
GENERAL E-MAIL: info@wnspat.com

August 27, 1997

VIA FEDERAL EXPRESS

4231 8200 2270

Ms. Susan Jerome
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the final draft of the above-entitled patent application, including the drawings and a Declaration, Power of Attorney and Petition. An Assignment is also enclosed. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes, with the following information to be submitted to them:

We have amended the original to reflect suggestions and comments made by you and the Micron Patent Legal Department on the previous draft.

Assuming that the patent application as amended meets with your approval and is now suitable for filing in the United States Patent and Trademark Office, we are forwarding a Declaration, Power of Attorney, and Petition and an Assignment for your signature to Micron's Patent Legal Department. If, however, there are minor changes, please make those corrections directly on the face of the patent application and date and initial (in the margin) each correction; then return the corrected patent

Ms. Susan Jerome
August 27, 1997
Page 2

application to the Micron Patent Legal Department. Micron's Patent Legal Department is holding the above-referenced documents for your signature. After your execution of these documents, they will be forwarded to us along with a final copy of the patent application. Upon our receipt of both the executed documents and the final copy of the patent application, we will proceed to file the final copy of the patent application in the Patent Office.

Should questions arise during any part of this review and comment process, please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff
G:\DATA\WPDOCS\DF\MICRON\11675099.FD

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawing (4 copies)
Declaration, Power of Attorney and Petition (1 copy)
Assignment (1 copy)

WORKMAN NYDEGGER & SEELEY

ATTORNEYS AT LAW
A PROFESSIONAL CORPORATION

1000 EAGLE GATE TOWER
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SALT LAKE CITY, UTAH 84111
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October 14, 1997

VIA FEDERAL EXPRESS

Ms. Susan Jerome
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

4231 8200 4088

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the revised final draft of the above-entitled patent application, including the drawings. A Declaration, Power of Attorney and Petition and an Assignment were previously forwarded to Micron's Patent Legal Department and are being held for you. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch. This draft corrects minor typographical errors and includes a table showing correspondence between the claims, the figures, and the embodiments.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes, with the following information to be submitted to them:

The following information is being provided in order to better understand the patent claims, figures, and various embodiments disclosed in the specification.

Claim	Figure	Embodiment	Description
1	9/15	1	Structure with contact plug as described at page 11 of the specification; Page 11, lines 1-12.

Claim	Figure	Embodiment	Description
19	10/15	2	Structure plus contact plug as described at page 11 of the specification; Page 11, lines 13-19.
20/19	14/15	2	
21/19			Two capacitors and two transistors.
22	11/15	3	Structure with contact plug as described at page 11 of the specification; Page 11, lines 20 to end of page.
23/22		3	Sleeve structure with contacts.
24/22		3	Adds two capacitors and two transistors.
25		1	Adds two capacitors and two transistors.
26/25			Sleeve contacts.
27	10 or 11	2 or 3	One transistor.
28			Adds two capacitors and two transistors.
29-31/27			Adds specific materials.
32	9		No capacitor or transistor and no dielectric layer is recited, but a contact hole 70 is completed to substrate 12; Page 11, lines 1-12.
34	14/15		Adds a contact plug as seen in Figures 14/15.
38	10/11		No capacitor or transistor, but a contact hole is completed to the substrate; Page 11, lines 13 to end.
40	14/15		Adds contact plug 92.
45	10/11		Adds one transistor and one capacitor.
51	10		Dielectric layer plus a contact plug.
53	13-15		No capacitor or transistor is recited.
54	13-15		Recites both a capacitor and a transistor.
57	13-15		Recites a capacitor and transistor structure, and a consolidated etch step to expose a contact on the semiconductor substrate and to make a void through the sleeve.

The foregoing information has been provided to enhance the understanding of the draft of the patent application enclosed herewith.

Ms. Susan Jerome
October 14, 1997
Page 3

Assuming that the patent application as amended meets with your approval and is now suitable for filing in the United States Patent and Trademark Office, please execute the Declaration, Power of Attorney, and Petition and the Assignment documents being held by in Micron's Patent Legal Department. If there are minor changes, please make those corrections directly on the face of the patent application and date and initial (in the margin) each correction; then return the corrected patent application to the Micron Patent Legal Department. After your execution of these documents, they will be forwarded to us along with a final copy of the patent application. Upon our receipt of both the executed documents and the final copy of the patent application, we will proceed to file the final copy of the patent application in the Patent Office.

Should questions arise during any part of this review and comment process, please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff

G:\DATA\WPDOCS\DF\MICRON\11675099.FD2

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawing (4 copies)



October 30, 1997

*Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111*

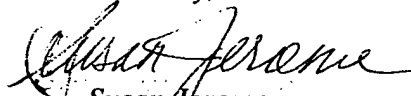
*RE: Micron Docket No. 95-1141
Your Ref. No. 11675.99
SELF-ALIGNING CONTACT STRUCTURE AND
METHOD OF MANUFACTURE*

Dear Brad:

Enclosed please find a revised draft application, for the above case, I am forwarding to you on behalf of Sam Ireland.

If you have any questions, please do not hesitate to call.

Sincerely,


Susan Jerome
Patent Assistant

*phone: (208) 368-4508
fax: (208) 368-5606*

(A)

MICRON

INTEROFFICE MEMO

TO: *Sam Ireland*

FROM: Susan Jerome (x84508)

DATE: 10/16/97

RE: 95-1141

Enclosed for your review is a draft application for the above disclosure. While you are reviewing the application, the legal department will be reviewing it as well. Therefore, it is very important that you mark any changes directly on the draft and return it to me so we can combine the revisions and forward them to outside counsel for correcting.

If you do not have any changes, please send me an e-mail indicating you have no changes and I will request the final documents for signature.

If you have any questions, or if I may be of assistance, please do not hesitate to call.

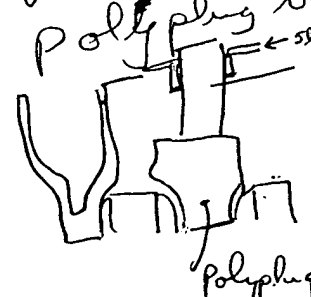
Thanks for your help!!

Please return your comments to the Patent Department no later than

10/30/97.

Thank you!

Probably should
cover the possibility
of landing on a
Polyphug version
← sleeve
conductive
contact
Polyphug

A hand-drawn schematic diagram of a device. It shows a central vertical component with a horizontal sleeve-like structure extending from its top. Below this, there are several rectangular blocks and lines representing electrical connections or contacts. The word 'Polyphug' is written at the bottom of the diagram.

WORKMAN NYDEGGER & SEELEY

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February 2, 1998

VIA FEDERAL EXPRESS

4231 8200 8234

Ms. Susan Jerome
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the revised final draft of the above-entitled patent application, including the drawings. A Declaration, Power of Attorney and Petition and an Assignment were previously forwarded to Micron's Patent Legal Department. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch. This draft adds a new embodiment suggested by the inventors which is depicted in new Figure 16.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes; with the following information to be submitted to them:

Assuming that the patent application as amended meets with your approval and is now suitable for filing in the United States Patent and Trademark Office, please execute the Declaration, Power of Attorney, and Petition and the Assignment documents being held by in Micron's Patent Legal Department. If there are minor changes, please make those corrections directly on the face of the patent application and date and initial (in the margin) each correction; then return the corrected patent application to the Micron Patent Legal Department. After your execution of these documents, they will be forwarded to us along with a final copy of the patent application. Upon our receipt of both the executed documents and the final copy of the patent application, we will proceed to file the final copy of the patent application in the Patent Office.

Ms. Susan Jerome
February 2, 1998
Page 2

Should questions arise during any part of this review and comment process,
please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff

G:\DATA\WPDOCS\DF\MICRON\11675099.FD3

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawings (4 copies)



February 10, 1998

*Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111*

*RE: Micron Docket No. 95-1141
Your Ref. No. 11675.99
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD FOR MANUFACTURE*

Dear Brad:

Enclosed please find a revised draft application, for the above case, I am forwarding to you on behalf of Howard Rhodes and Sam Ireland.

If you have any questions, please do not hesitate to call.

Sincerely,

A handwritten signature in black ink, which appears to read "Susan Jerome". The signature is fluid and cursive, written over the printed name.

*Susan Jerome
Patent Assistant*

*phone: (208) 368-4508
fax: (208) 368-5606*

WORKMAN NYDEGGER & SEELEY

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March 30, 1998

VIA FEDERAL EXPRESS

Ms. Susan Jerome
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

4231 8201 0484

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the revised final draft of the above-entitled patent application, including the drawings. A Declaration, Power of Attorney and Petition and an Assignment were previously forwarded to Micron's Patent Legal Department. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes, with the following information to be submitted to them:

Assuming that the patent application as amended meets with your approval and is now suitable for filing in the United States Patent and Trademark Office, please execute the Declaration, Power of Attorney, and Petition and the Assignment documents being held by in Micron's Patent Legal Department. If there are minor changes, please make those corrections directly on the face of the patent application and date and initial (in the margin) each correction; then return the corrected patent application to the Micron Patent Legal Department. After your execution of these documents, they will be forwarded to us along with a final copy of the patent application. Upon our receipt of both the executed documents and the final copy of the patent application, we will proceed to file the final copy of the patent application in the Patent Office.

Ms. Susan Jerome
March 30, 1998
Page 2

Should questions arise during any part of this review and comment process,
please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff
G:\DATA\WPDOCS\DFM\MICRON\11675099.FD4

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawings (4 copies)

WORKMAN NYDEGGER & SEELEY

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MICHAEL T. SANDERSON

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OF COUNSEL

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April 8, 1998

VIA FEDERAL EXPRESS

4231 8201 0819

Ms. Susan Jerome
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the revised final draft of the above-entitled patent application, including the drawings. A Declaration, Power of Attorney and Petition and an Assignment where previously forwarded to Micron's Patent Legal Department. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes, with the following information to be submitted to them:

Assuming that the patent application as amended meets with your approval and is now suitable for filing in the United States Patent and Trademark Office, please execute the Declaration, Power of Attorney, and Petition and the Assignment documents being held by in Micron's Patent Legal Department. If there are minor changes, please make those corrections directly on the face of the patent application and date and initial (in the margin) each correction; then return the corrected patent application to the Micron Patent Legal Department. After your execution of these documents, they will be forwarded to us along with a final copy of the patent application. Upon our receipt of both the executed documents and the final copy of the patent application, we will proceed to file the final copy of the patent application in the Patent Office.

Ms. Susan Jerome
April 8, 1998
Page 2

Should questions arise during any part of this review and comment process,
please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff
G:\DATA\WPDOCS\DFM\MICRON\11675099.FD5

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawings (4 copies)



April 21, 1998

*Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111*

*RE: Micron Ref. No. 95-1141
Your Ref. No. 11675.99
SELF-ALIGNING CONTACT STRUCTURE AND METHOD
OF MANUFACTURE*

Dear Brad:

Enclosed please find a revised draft application, for the above case, I am forwarding to you on behalf of Sam Ireland and Howard Rhodes. Please incorporate these comments into a new draft for their review.

If you have any questions, please do not hesitate to call.

Sincerely,

A handwritten signature in cursive script, appearing to read "Susan Jerome".

*Susan Jerome
Patent Assistant*

*phone: (208) 368-4508
fax: (208) 368-5606*



April 6, 1998

*Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111*

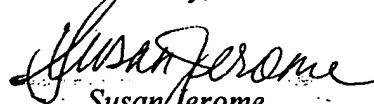
*RE: Micron Ref. No. 95-1141
Your Ref. No. 11675.99
SELF-ALIGNING CONTACT STRUCTURE AND METHOD
OF MANUFACTURE*

Dear Brad:

Enclosed please find a revised draft application, for the above case, I am forwarding to you on behalf of the inventor(s). Please incorporate these comments into a final draft for their review.

If you have any questions, please do not hesitate to call.

Sincerely,


Susan Jerome
Patent Assistant

*phone: (208) 368-4508
fax: (208) 368-5606*

WORKMAN NYDEGGER & SEELEY

ATTORNEYS AT LAW
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June 18, 1998

VIA FEDERAL EXPRESS

Ms. Susan Jerome
MICRON TECHNOLOGY, INC.
Mail Stop #525
8000 South Federal Way
P.O. Box 6
Boise, ID 83707-006

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the revised final draft of the above-entitled patent application, including the drawings. A Declaration, Power of Attorney and Petition and an Assignment where previously forwarded to Micron's Patent Legal Department. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes, with the following information to be submitted to them:

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Ms. Susan Jerome
June 18, 1998
Page 2

Should questions arise during any part of this review and comment process,
please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff
G:\DATA\WPDOCS\DFMICRON\11675099.FD6

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawings (4 copies)



August 27, 1998

*Bradley K. DeSandro, Esq.
Workman, Nydegger & Seeley
1000 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111*

*Via Facsimile 801-328-1707
7 pages to follow*

*RE: Micron Reference No. 95-1141
Your Reference No. 11675.99
CONTACT STRUCTURE AND METHOD FOR MANUFACTURE*

Dear Brad:

Enclosed please find revisions to the last draft for the above case. Please incorporate these comments into a new draft for the inventors' review.

If you have any questions, please do not hesitate to call.

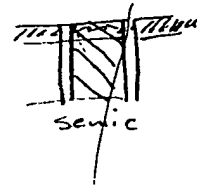
Sincerely,

A handwritten signature in cursive script, appearing to read 'Susan Jerome', is written over the typed name.

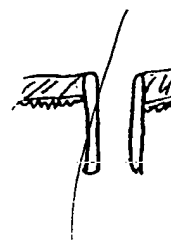
*Susan Jerome
Patent Assistant*

*phone: (208) 368-4508
fax: (208) 368-5606*

- ✓ 1. A contact structure for an integrated circuit comprising:
- a lower bulk insulator layer situated above a semiconductor substrate;
- a conductor layer situated above the lower bulk insulator layer;
- a sleeve insulator layer in contact with the conductor layer; and
- a conductor structure extending from the sleeve insulator layer to terminate at a contact on said semiconductor substrate, said conductor structure being electrically insulated from the conductor layer by the sleeve insulator layer.

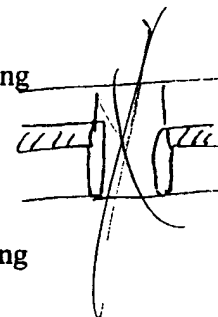


- ✓ 2. The contact structure as defined in Claim 1, wherein a dielectric layer is situated above the lower bulk insulator layer; and wherein the conductor layer is situated above the dielectric layer.



- ✓ 3. The contact structure as defined in Claim 2, wherein said dielectric layer extends to make contact with the sleeve insulator layer.

- ✓ 4. The contact structure as defined in Claim 1, wherein an electrically insulating layer is situated upon the conductor layer.



- ✓ 5. The contact structure as defined in Claim 4, wherein the electrically insulating layer upon the conductor layer is formed conformably upon the conductor layer.

- ✓ 6. The contact structure as defined in Claim 4, wherein the electrically insulating layer upon the conductor layer is an upper bulk insulator layer having sidewall, where in the sidewall of the upper bulk insulator layer is in contact with the sleeve insulator layer.

7. The contact structure as defined in Claim 1, wherein the sleeve insulator layer extends from the conductor layer to terminate within the lower bulk insulator layer above the semiconductor substrate, said sleeve insulator layer extending through and being in contact with each of the lower bulk insulator layer and the conductor layer.

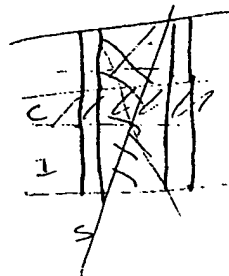
8. The contact structure as defined in Claim 1, wherein the conductor structure is at least partially circumscribed by and is in contact with said sleeve insulator layer.

9. The contact structure as defined in Claim 1, wherein each of the lower bulk insulator layer and the conductor layer has a sidewall in contact with the sleeve insulator layer.

10. The contact structure as defined in Claim 1, wherein said conductor layer extends from said sleeve insulator layer to make contact with a dielectric layer.

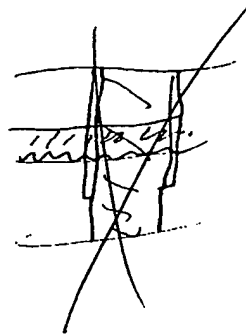
11. The contact structure as defined in Claim 1, wherein said conductor structure has an end on said semiconductor substrate that is composed of a refractory metal silicide material.

12. The contact structure as defined in Claim 1, wherein said sleeve insulator layer is composed of a material selective from the group consisting of Ta_2O_5 and Si_3N_4 .



13. A contact structure for an integrated circuit comprising:
- a lower bulk insulator layer situated above a semiconductor substrate;
 - a conductor layer situated above the lower bulk insulator layer;
 - an upper bulk insulator layer upon the conductor layer, said upper bulk insulator layer having sidewall;
 - a sleeve insulator layer in contact with the conductor layer, wherein the sidewall of the upper bulk insulator layer is in contact with the sleeve insulator layer; and
 - a conductive plug extending from the sleeve insulator layer to terminate at a contact on said semiconductor substrate, said conductive plug being electrically insulated from the conductor layer by the sleeve insulator layer.

14. The contact structure as defined in Claim 13, wherein:
- a dielectric layer is situated above the lower bulk insulator layer;
 - the conductor layer is situated upon the dielectric layer;
 - the dielectric layer extends to make contact with the sleeve insulator layer; and
 - the conductive plug is at least partially circumscribed by and is in contact with said sleeve insulator layer.



✓ 15. A contact structure for an integrated circuit comprising:
a lower bulk insulator layer situated above a semiconductor substrate;
a dielectric layer situated above the lower bulk insulator layer;
a conductor layer situated above the lower bulk insulator layer and above the dielectric layer;
an electrically insulating layer situated upon the conductor layer;
a sleeve insulator layer in contact with the conductor layer and extending from the conductor layer to terminate within the lower bulk insulator layer above the semiconductor substrate, said sleeve insulator layer extending through and being in contact with each of the lower bulk insulator layer and the conductor layer, wherein each of the lower bulk insulator layer and the conductor layer has a sidewall in contact with the sleeve insulator layer; and
a conductive plug extending from the sleeve insulator layer to terminate at a contact on said semiconductor substrate, said conductive plug being electrically insulated from the conductor layer by the sleeve insulator layer.

✓ 16. The contact structure as defined in Claim 15, wherein the electrically insulating layer is formed conformably upon the conductor layer.

✓ 17. The contact structure as defined in Claim 15, wherein the electrically insulating layer upon the conductor layer is an upper bulk insulator layer having sidewall, where in the sidewall of the upper bulk insulator layer is in contact with the sleeve insulator layer.

1 An embodiment of the invention will now be described with reference to Figures 1-
2 9. Referring to Figure 1, a semiconductor substrate 10 comprises a silicon substrate 12
3 with a gate insulating layer 14, field oxide regions 16, active or source/drain regions 18a and
4 18b, and access transistors 20. Each access transistor 20 has a gate electrode 24, insulating
5 protective layer 28, and insulating spacers 30 that are formed on the sides thereof. A lower
6 bulk insulator layer 36 is then deposited and if necessary, planarized. Lower bulk insulator
7 layer 36 is preferably made of a dielectric material such as borophosphosilicate glass
8 (BPSG), phosphosilicate glass (PSG), borosilicate glass (BSG), or spin on glass (SOG).

9 Referring to Figure 2, lower bulk insulator layer 36 is patterned and etched to define
10 a volume 56 in which a capacitor is to be formed in lower bulk insulator layer 36. Volume
11 56 exposes portions of substrate 12 at source/drain regions 18a.

12 Referring to Figure 3, a storage plate 40 is deposited. Storage plate 40, which is
13 substantially composed of an electrically conductive material, is preferably composed of
14 doped polysilicon or doped rough textured polysilicon. Referring to Figure 4, storage plate
15 40 has been ~~patterned and~~ subjected to an planarizing process, such as chemical mechanical
16 polishing, to form a storage node layer 42.

17 Referring to Figure 5, a capacitor cell dielectric layer 44 is deposited. Capacitor cell
18 dielectric layer 44, which intended to form a portion of dielectric material for a capacitor, is
19 preferably made of Si_3N_4 or other electrically insulative suitable material such as Ta_2O_5 , or
20 barium strontium titanate (BST). A cell plate layer 46 is then deposited. Cell plate layer 46
21 is intended to form a cell plate portion of a capacitor in an integrated circuit.

22 A cell plate insulating layer 48 is deposited over cell plate layer 46 so as to
23 electrically insulate portions of cell plate layer 46. Cell plate insulating layer 48 is preferably
24 substantially composed of Si_3N_4 , but may also be substantially composed of silicon dioxide
25 or other suitable electrically insulative materials. Preferably, etching processing, which may
26 follow in the process flow, will be selective to the materials of which capacitor cell plate

Handwritten note:
The poles, built and pulled in used.

insulating layer 48 is composed. As such, cell plate insulating layer 48 need not necessarily be composed of silicon nitride, but can be composed of another dielectric that resists a BPSG etch or a dielectric etch that is selective to lower bulk insulator layer 36.

The method of forming a first preferred embodiment of the present invention is set forth below and illustrated in Figures 6-11. Figure 6 is a section 100 taken from Figure 5 and expanded to illustrate greater detail. Referring to Figure 6, there is illustrated lower bulk insulator layer 36, capacitor cell dielectric layer 44, cell plate layer 46, and cell plate insulating layer 48 which is deposited over cell plate layer 46.

Referring to Figure 7, there is illustrated a first etch step wherein a photoresist layer 60 is spun on, exposed, and selectively removed during development to expose a preferred bit line contact site. The first etch step etching cell plate layer 46 and may involve the use of an isotropic component. The first step can, however, be anisotropic so as to form a contact hole 70 with minimal undercutting of cell plate layer 46. The first etch step penetrates the noted conductive and insulative layers and partially penetrates into lower bulk insulator layer 36.

Referring to Figure 8, the next step of the present invention method is carried out in which the remaining portions photoresist layer 60 have been removed, and then a sleeve insulator layer 50 is deposited upon the uppermost surface of cell plate insulating layer 48 and also within the BLCC. An ambient pressure chemical vapor deposition (CVD) process can be used to assist in lateral deposition of sleeve insulator layer 50 upon the sidewalls of the BLCC. Other methods, however, can be employed which are calculated to achieve suitably conformal depositions. A preferred CVD substance for sleeve insulator layer 50 is Si_3N_4 , SiO_2 (by decomposition of a tetraethylorthosilicate precursor), Ta_2O_5 , or barium strontium titanate (BST), although the etchant used to etch lower bulk insulator layer 36 should be selective to the substance of sleeve insulator layer 50.

resulting
in an
undercut
in cell
plate
layer 46
below
cell plate
insulating
layer 48
and
above
capacitor
cell dielectric
layer 44.

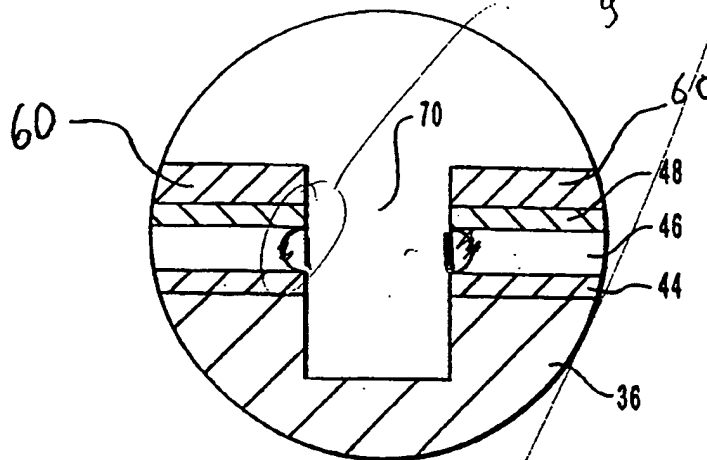


FIG. 7

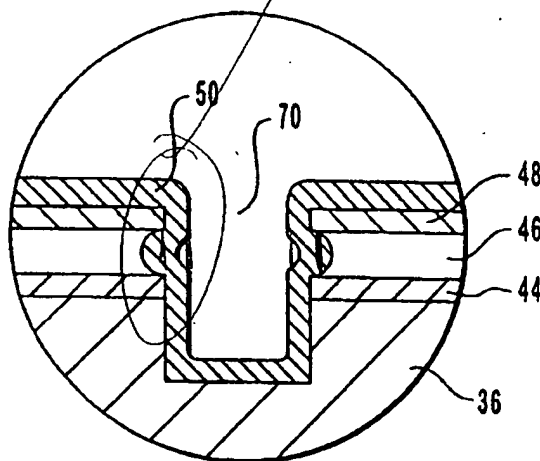


FIG. 8

*We prefer this to
90° straight, but
possibly having an
isotropic steel
I guess leave
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WORKMAN NYDEGGER & SEELEY

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August 31, 1998

VIA FEDERAL EXPRESS

Ms. Susan Jerome
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4231 8201 7570

Re: New United States Patent Application for
SELF-ALIGNING CONTACT STRUCTURE
AND METHOD OF MANUFACTURE
Our File No.: 11675.99
Your Ref. No.: 95-1141

Dear Sue:

Enclosed for your files is a copy of the revised final draft of the above-entitled patent application, including the drawings. A Declaration, Power of Attorney and Petition and an Assignment were previously forwarded to Micron's Patent Legal Department. Copies of the above-entitled patent application and drawings, are enclosed for review by Mike Lynch.

Copies of the above-entitled patent application are also enclosed for review by Philip J. Ireland and Howard E. Rhodes, with the following information to be submitted to them:

Assuming that the patent application as amended meets with your approval and is now suitable for filing in the United States Patent and Trademark Office, please execute the Declaration, Power of Attorney, and Petition and the Assignment documents being held by in Micron's Patent Legal Department. If there are minor changes, please make those corrections directly on the face of the patent application and date and initial (in the margin) each correction; then return the corrected patent application to the Micron Patent Legal Department. After your execution of these documents, they will be forwarded to us along with a final copy of the patent application. Upon our receipt of both the executed documents and the final copy of the patent application, we will proceed to file the final copy of the patent application in the Patent Office.

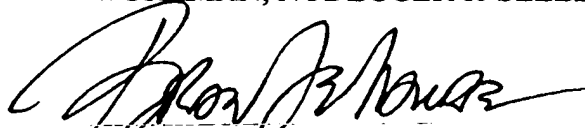
Ms. Susan Jerome
August 31, 1998
Page 2

Should questions arise during any part of this review and comment process,
please contact Sue Jerome in Micron's Patent Legal Department, or myself.

Best regards.

Cordially,

WORKMAN, NYDEGGER & SEELEY



BRADLEY K. DeSANDRO

BKD:dff
G:\DATA\WPDOCS\DFMICRON\11675099.FD7

cc: Michael Lynch
Philip J. Ireland
Howard E. Rhodes

Enclosures: Patent Application (4 copies)
Drawings (4 copies)